Second Substitute Specification

TITLE OF THE INVENTION

[0001] Method for Measuring the Concentration of Water in Argon, Hydrogen, Nitrogen and Helium by Ionization Mobility Spectrometry

CROSS-REFERENCE TO RELATED APPLICATIONS

[0002] This application is a continuation of International Application No. PCT/IT02/00370, filed June 6, 2002, which was published in the English language on December 12, 2002, under International Publication No. WO 02/099405 A2.

BACKGROUND OF THE INVENTION

[0003] The present invention relates to a method for measuring the concentration of water in argon, hydrogen, nitrogen and helium by ionization mobility spectrometry.

[0004] These gases are widely used in the semiconductor industry as transport gases in which reactive species are diluted or as support gases for plasma formation in cathodic deposition processes (in particular, helium and argon are employed for these uses), as well as real reagents in the process (in particular in the case of nitrogen). Among these gases, argon is the most important for industry. In the rest of this specification this gas will be mainly referred to, but the invention may also be applied with the same results to the other cited gases.

[0005] The pureness of the argon employed in the semiconductor industry is particularly important. As a matter of fact, contaminants which may be present in the reagents or in the reaction environment can be incorporated into the solid state devices, thereby altering their electrical or magnetic properties and thus leading to production rejects.

[0006] Argon purification is the subject-matter of various patents, such as British Patent GB-B-2177079 (similarly, British Patent GB-B-2177080 relates to nitrogen purification and U.S. Patents 5,558,844 and 5,556,603 relate to hydrogen purification). According to this patent, argon is purified by passing it through a bed made of a getter material (an alloy based on zirconium, vanadium and iron) kept at a temperature between 350 and 450 °C. Alternatively, purifiers working at room temperature are commonly employed, which are based on the use of nickel generally dispersed onto a high surface area support, such as alumina or molecular sieves. With these methods the impurity content can be reduced below one part per billion (ppb, equivalent to one impurity molecule for every 10^9 molecules of argon).